REMARKS

Claims 1-5 were previously cancelled. Claims 6, 9, 26, 29, 34, 37 and 39 have been amended. Claims 6-45 are pending.

Claims 22-25 and 42-45 have been allowed. Claims 14, 17, 19, 34, 37 and 39 have been objected to as dependent upon a rejected base claim, but would be allowable if rewritten in independent form. Claims 6-12 and 26-33 have been rejected as obvious in view of U.S. Patent No. 5,990,904 to Griffin and U.S. Patent No. 5,809,219 to Pearce. Claims 13, 15, 18 and 35 have been rejected as obvious in view of Griffin, Pearce, and U.S. Patent No. 6,426,755 to Deering. Claims 9, 16, 18, 29, 36 and 38 have been rejected as obvious in view of Pearce and U.S. Patent Publication No. 2002/0097241 A1 to McCormack. Claims 20-21 and 40-41 have been rejected as obvious in view of McCormack, Pearce, and Deering. The applicant traverses these rejections and requests reconsideration of claims 6-21 and 26-41 in view of the following remarks.

Response to Rejections in View of Griffin, Pearce and Deering

The Examiner rejected claims 6-12 and 26-33 as obvious in view of Griffin and Pearce, and rejected claims 13, 15, 18 and 35 as obvious in view of Griffin, Pearce, and Deering. The applicant submits that each of claims 6-13, 15, 18, 26-33 and 35, as amended, are patentable over any combination of these references for the following reason.

Independent claims 6, 9, 26 and 29, as amended, recite creating or receiving a motion buffer, wherein the motion buffer contains a scan-converted 3-D object or object primitive's "local color, depth coverage, transfer mode, rate of change of depth with time and surface geometry information, wherein the surface geometry information comprises spatial information about the object's surface." The information from a scan-converted 3-D object that can be stored in a motion buffer to represent its surface geometry information, i.e., the spatial information about that 3-D object's surface, is described in the specification as follows:

> In one implementation, the surface geometry of an object rendered to an output buffer is approximated by a series of planes, where each plane approximates the object's local surface geometry over an output buffer pixel. Other surface geometry approximations can be made however. For example, the surface geometries of objects can be approximated by the upper or lower surfaces of hyperboloids or other 3-dimensional geometric objects or functions.
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> When the surface geometry of an object is approximated by a series of planes, the orientation of a plane . . . can be stored as the components of a unit vector that is normal to the surface of the plane, or as a pair of slopes *dz/dx* and *dz/dy* that correspond to the slopes of the plane. . . . [T]he slopes *dz/dx* and *dz/dy* of an object primitive's representative plane are not necessarily single-valued over the entire area of the output buffer pixel or over the shutter-interval of the scene. Consequently, any reasonable measure of the slopes of a representative plane can be stored in the orientation *dz/dx* 350 and *dz/dy* 360 of pixel fragment 220. In one implementation, the orientation *dz/dx* 350 and *dz/dy* 360 is the coverage-weighted orientation, or the average value of *dz/dx* 350 and *dz/dy* 360 of the object primitive's tangential planes over the spatial extent of the output buffer pixel and the temporal extent of the shutter-interval.
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> *Specification* at page 6, line 22 through page 7, line 12.

For each of the rejected claims, the Examiner relies on Griffin's 4 x 4 coverage bitmask to meet the limitation of creating or receiving a motion buffer that stores a scan-converted 3-D object or object primitive's "surface geometry information." However, Griffin describes his coverage bitmask as "a 4 x 4 pixel coverage <u>bitmask</u> for each pixel which is partially covered." *Griffin* at 34:56-58 (emphasis added). Griffin's coverage bitmask is generated using a two step process whose "first step is to determine how many of the <u>subpixel</u> bits in the coverage mask are to be turned on, and [whose] second step is to determine which specific bits are to be enabled." *Id.* at 34:66-35:3 (emphasis added). Thus, Griffin's coverage bitmask is nothing more than a sub-pixel mask that indicates to what extent a given output buffer pixel is covered or painted by a 3-D object that is projected onto that pixel. As such, Griffin's coverage bitmask provides no information about the surface geometry of the 3-D object that is projected onto the output buffer pixel such as the object surface's slope or its normal vector.

An example may help to explain the point. Assume that Griffin's output buffer pixels are sub-divided into four quadrants delineated the upper left (ul), upper right (ur), lower left (ll) and lower right (lr) quadrants. The output buffer pixel's coverage can then be represented by the following 2 x 2 or four element coverage bitmask: (ul, ur, ll, lr).[1] If a 3-D object is projected onto an output buffer pixel such that it only covers the upper left quadrant of the pixel, Griffin's coverage bitmask for that pixel would be (1,0,0,0). Similarly, if the 3-D object is projected in such a way that it only covers the upper right quadrant of the pixel, Griffin's coverage bitmask for that pixel would be (0,1,0,0). Note that the coverage bitmask does NOT contain any information about the surface geometry of the 3-D object that was projected onto the output buffer pixel. The projected 3-D object may have had spherical, cubic, trapezoidal, ellipsoidal or any other surface geometry or shape. The only information stored in Griffin's coverage pixel bitmask is the area of the output buffer pixel that is covered by the projection of the 3-D object's surface onto the pixel.

Since claims 6-13, 15, 18, 26-33 and 35 recite creating or using a motion buffer in which each scan-converted 3-D object or object primitive's "color, depth, coverage, transfer mode, rate of change of depth with time and surface geometry information" is stored, "wherein the surface geometry information comprises spatial information about the object's surface," and since Griffin whether taken alone or in combination with any of Pearce or Deering fails to disclose this limitation, claims 6-13, 15, 18, 26-33 and 35 are patentable over the Griffin, Pearce, or Deering references, whether taken alone or in any combination, for at least this reason.

Response to Rejections in View of McCormack, Pearce and Deering

The Examiner rejected claims 9, 16, 18, 29, 36 and 38 as obvious in view of McCormack and Pearce, and rejected claims 20-21 and 40-41 as obvious in view of McCormack, Pearce, and

[1] Note that in Griffin each of these quadrants is further divided into quadrants to obtain a 4 x 4 or 16 element coverage bitmask. However, the simplified discussion using a 2 x 2 element coverage bitmask does not change the essential point being discussed, which is that the sub-pixel coverage bitmask only stores the coverage information of the pixel being rendered. It does not store any information about the surface geometry or orientation of the 3-D object that is at least partially projected onto the pixel being rendered.

Deering. The applicant submits that each of claims 6-13, 15, 18, 26-33 and 35, as amended, are patentable over any combination of these references for the following reason.

Independent claims 9 and 29, as amended, recite receiving a motion buffer, wherein the motion buffer contains a scan-converted 3-D object or object primitive's "local color, depth coverage, transfer mode, rate of change of depth with time, and surface geometry information, wherein the surface geometry information comprises spatial information about the object's surface." An object primitive's "rate of change of depth with time" is the rate at which its depth or *z*-component changes with time, i.e., it's the object primitive's *z*-component of velocity or *dz/dt* as disclosed in the specification.

For each of the rejected claims, the Examiner relies on McCormack's Z gradient values 438 to meet the limitation of creating or receiving a motion buffer that stores a scan-converted 3-D object or object primitive's "rate of change of depth with time." But McCormack's Z gradient values 438 are the same as McCormack's Z gradient values 318. *See, McCormack* at ¶ 111. And McCormack's Z gradient values 318 are just the A and B components that represent the spatial slope of an object or object primitive's surface, i.e., its *dz/dx* and *dz/dy* values, respectively. *See, Id.* at ¶¶ 70-72. Nowhere does McCormack suggest or disclose saving an object primitive's rate of change of depth with time or *dz/dt* value. The applicant submits that saving an object primitive's spatial slope cannot meet the limitation of saving an object primitive's rate of change of depth with time. For example, an object primitive's surface can have zero spatial slope (i.e., it can be a flat plane), and yet it can have a non-zero rate of change of depth with time (e.g., because the flat plane is rising or falling in the z-dimension). Similarly, an object primitive can have a non-zero spatial slope (i.e., it can be angled), and yet have a zero rate of change of depth with time (e.g., because the angled plane is stationary or not rising and falling in the z-dimension).

Since claims 9, 16, 18, 20-21, 29, 36, 38 and 40-41 recite creating or using a motion buffer in which each scan-converted 3-D object or object primitive's "color, depth, coverage, transfer mode, rate of change of depth with time and surface geometry information" is stored, and since McCormack whether taken alone or in combination with any of Pearce or Deering fails